

Modeling, Calibration and Control for Extreme-Precision MEMS Deformable Mirrors, Phase I

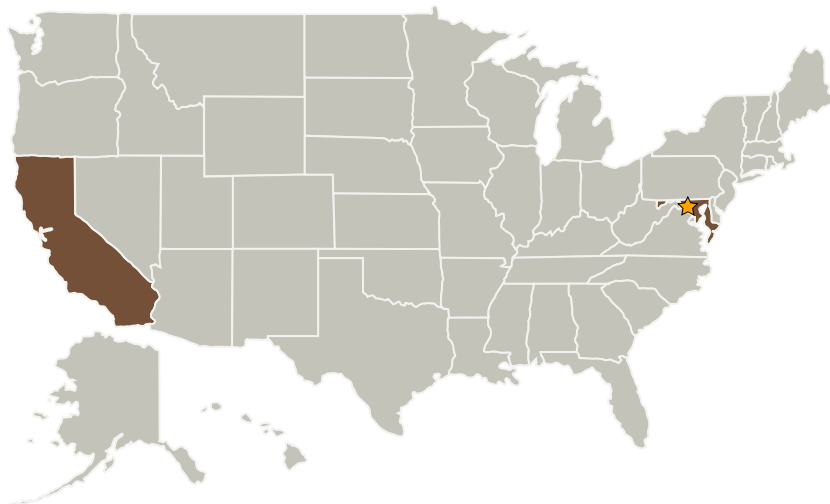
Completed Technology Project (2006 - 2006)



Project Introduction

Iris AO will develop electromechanical models and actuator calibration methods to enable open-loop control of MEMS deformable mirrors (DMs) with unprecedented precision. Error budget analysis will establish feasibility of open-loop operation with nanometer-scale positioning accuracy and sub-nanometer resolution and stability. Although a number of MEMS based DMs have been demonstrated for adaptive optics applications, little work has been carried out to characterize their wavefront correction ability to precisions required by NASA space telescope missions. This proposal directly addresses this issue for a class of electrostatically actuated DMs with extremely high optical quality and low voltage-to-stroke ratios. High-precision, large actuator count DMs are critical for high-contrast astrophysical imagers, including the Terrestrial Planet Finder program. Existing non-MEMS DMs that approach NASA requirements feature high actuation voltages, low actuator densities and uncertain scalability beyond a few thousand actuators. MEMS DMs offer natural scalability, but do not yet meet the stringent precision and stability requirements for space telescopes applications. Better understanding of the electromechanical behavior, positioning error sources and calibration methods for these devices is essential to understand and improve performance, bringing MEMS DMs to mission readiness.

Primary U.S. Work Locations and Key Partners



Modeling, Calibration and Control for Extreme-Precision MEMS Deformable Mirrors, Phase I

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	2
Technology Areas	2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Modeling, Calibration and Control for Extreme-Precision MEMS Deformable Mirrors, Phase I

Completed Technology Project (2006 - 2006)



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Iris AO, Inc.	Supporting Organization	Industry	Berkeley, California

Primary U.S. Work Locations

California	Maryland
------------	----------

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.2 Observatories
 - └ TX08.2.1 Mirror Systems